[10191/2289]

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

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In re Application of: :
: Examiner: Andrew T. Sever
Peter KNOLL et al. :

For: DISPLAY APPARATUS :

Filed: July 19, 2002 : Art Unit: 2851

Serial No.: 10/088,727

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Date: 6/1/2006

Signature:

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(33,865)

SUPPLEMENTAL REPLY BRIEF As Requested by
March 8, 2006 Board Decision and in Response to
Supplemental Examiner's Answer of June 10, 2006

SIR:

Appellant submits the present Supplemental Reply Brief (the two-month response date for which is June 12, 2006 (since June 10, 2006 is a Saturday)) in response to the Supplemental Examiner's Answer mailed on April 10, 2006 ("the Supplemental Answer"). Although not required, two duplicate copies of this Reply Brief are also being submitted herewith as a courtesy to the Patent Office.

For the reasons set forth in the Appeal Brief and the Reply Brief (both of which are hereby incorporated by reference) and those set forth below in this Supplemental reply Brief, it is again respectfully submitted that the final rejections of claims 16 to 42 should be reversed.

REMARKS

The following is submitted as regards the Supplemental Answer of April 10, 2006 and the questions raised in the Board Decision of March 8, 2006:

A. The Rejections Under 35 U.S.C. § 103(a) That Claims 16 to 26 and 31 to 42 Are Unpatentable Over Jost et al., U.S. Patent No. 4,919,517 In View of Kleinschmidt, U.S. Patent No. 6,750,832

Claims 16 to 26 and 31 to 42

Claims 16 to 26 and 31 to 42 were rejected under 35 U.S.C. § 103(a) as unpatentable over Jost et al., U.S. Patent No. 4,919,517 (the "Jost" reference) in view of Kleinschmidt, U.S. Patent No. 6,750,832 (the "Kleinschmidt" reference).

The "Jost" Reference

The "Jost" reference refers to a projection unit in the roof, in which the image (which is generated in a liquid crystal display (LC matrix 6)) is imaged by a lens optical system. The light rays are directed by the lens optical system to a mirror (collimator 11), which deflects the light rays to the windshield 1. In this manner, a virtual image is created for a driver (see "Jost", column 1, lines 62 to 65; column 3, lines 39 to 43). In this context, the lens optical system and mirror 11 are situated so that virtual intermediate image 10 is already generated by mirror 11. This may be seen directly in Figure 1, since intermediate image 10 is only deflected in its direction by the windshield. That makes it plain from the "Jost" reference that the mirror 11 generates a virtual image. In contrast to the assertions of the Examiner (namely, that the "Jost" reference is silent on which image mirror 11 gives off, the "Jost" reference makes plain that in its system, the mirror 11 generates only a virtual image.

In this regard, if a driver were at the position of the windshield, and if he viewed the mirror 11 from there, the driver would be presented with the same virtual image 10. Consequently, the "Jost" reference is not silent about whether a real or a virtual image is produced, but teaches explicitly that only a virtual image is generated using the mirror 11.

In addition, the generation of a real image generated onto a display surface would not even be possible. To date, the Examiner has asserted that a real image is able to be generated using a concave mirror. For example, a concave mirror may be used to generate a real image. Since the mirror is curved, it is able to collect light. It therefore has a function comparable to a collective lens. As the Examiner has asserted, by an additional display surface, at a suitable place in the beam path, using the concave mirror on this additional display surface, a real image itself may be projected.

However, the claimed subject matter provides that the real image is projected onto the display surface, but the "Jost" reference has no such display surface onto which a real image is projected. In particular, no real image is projected on mirror 11. As explained, the mirror is the only the way to generate the image at all. For comparison purposes, even on the lens itself the real image is not projected. This is because a screen is required, onto which the image is projected, using the lens. According to the wording of the claim, however, on the display surface itself (mirror 11, as asserted by the Examiner) the real image would have to be projected. However, according to the "Jost" reference, this is not the case. Therefore, the "Jost" reference cannot anticipate the presently claimed subject matter nor make it obvious.

Attached for the information of the Board is a book ("introduction to physics for scientists and engineers", 2nd edition, 1975) section entitled "Spherical Mirrors: Concave Mirrors". This book section makes plain that the real image is not created on the mirror -- but in the "focal point" outside the mirror.

It is also noted that not every concave mirror is used for generating images (see, for example, Figure 30.10 of "Spherical Mirrors: Concave Mirrors"). However, the Examiner has nowhere demonstrated that the concave mirror used in the "Jost" reference would at all be in a position to perform the image generation of a real image. The "Jost" reference is also silent on this matter.

Accordingly, a real image within the context of the claimed subject matter is not generated upon 1 or 11 of the "Jost" reference, and 1 and 11 are not "display surfaces" as provided for in the context of the claimed subject matter, when understood in view of the specification.

<u>The "Kleinschmidt" Reference</u>

In the exemplary embodiment according to Figure 19 of the "Kleinschmidt" reference, a video back-projection is shown, in which the image is projected on a diffuser in front of the driver. For this, a video projection optical system is provided, the light rays being scattered at the diffuser, so that a real image is visible to the viewer on the diffuser.

The presently claimed subject matter differs from the "Kleinschmidt" reference in that the projection unit in "Kleinschmidt" is not situated at the vehicle roof, but on the instrument panel. Furthermore, it differs in that the display area itself is situated connected to the projection unit in a housing. Claim 16 requires a separated situation, in which the display surface is separate from projection unit. Indeed, in the "Kleinschmidt" reference, no hint is given that one should apply the projection unit at the roof of the vehicle. In addition, according to the "Kleinschmidt" reference, this location is already occupied by a camera that is supposed to observe the driver. Accordingly, the "Kleinschmidt" reference teaches away from the presently claimed subject matter.

In addition, the Examiner refers to the exemplary embodiments according to Figures 23 and 24, which are to a combination of a heads-up display with a real display. Corresponding to the design as in Figure 19, an image is projected first of all from the back side onto a diffuser STRS. For this real image to become visible to the viewer, a lens having light deflection prisms is laid onto the real image, so that the real image is deflected in the direction of the viewer (FPR, BL). The virtual image is now created in that the real image of the diffuser is projected against the windshield, so that the light on the windshield is mirrored, and thus, for the driver, a virtual image is created in front of him. This embodiment shows neither a projection unit at the vehicle's roof, nor a display area for a real image outside the projection unit.

<u>Overall view of the "Jost" and "Kleinschmidt" References</u>

According to the "Kleinschmidt" reference, it may be problematical to make the virtual image visible for the driver on the pane. Therefore, it may be advantageous also to display a real image for the driver. Now, the "Kleinschmidt" reference refers to providing a diffuser directly at the projection unit, and deflecting the light in the direction of the driver.

For that reason, one skilled in the art, if he wished to represent a real image, starting from the "Jost" reference and taking into consideration the "Kleinschmidt" reference, would provide a light deflecting plate, according to Figure 24, at the projection unit at the roof, and would deflect the light from the projection unit at the roof directly in the direction of the driver. This is because the generation of the real image on the diffuser, according to Figure 24, is equivalent to the generation of the real image on the LC matrix 6, according to the "Jost" reference. According to the "Kleinschmidt" reference, however, only from the plane of the image generation of the image itself (that is to be generated) is a real image guided in the direction of the driver. Therefore, one skilled in the art, even when taking an overall view of the "Jost" and "Kleinschmidt" references, does not arrive at providing a further additional display surface outside of a projection unit at the roof, to project a real image on it. However, this is required in Claim 16. Therefore, the claim cannot be made obvious by taking an overall view.

The "Kleinschmidt" reference does not in any way disclose or even suggest that one should provide a projector at the roof of the vehicle, instead of on the instrument panel. This suggestion is not made, also because the "Kleinschmidt" reference, in the specific embodiment according to Figure 23, refers to a combination of a heads-up display in an instrument display in the area of a usual pointer display in the instrument panel. Thus, to one skilled in the art, there is no suggestion that one should provide a projection unit at the roof of the vehicle. While the "Jost" reference shows a projection unit, in which light is directed to the windshield – but this is done only to generate a virtual image via the mirror. Even if one skilled in the art were to import the device according to "Jost" for the projection of the virtual image into a device according to the "Kleinschmidt" reference, there would be no suggestion to provide the projection so that a real image is also projected. The projection area according to "Kleinschmidt" (as becomes clear, for example, from Figure 23) is covered by the steering wheel. Consequently, during a projection from a vehicle roof, the steering wheel would be in the light path of the projection. Therefore, depending on the setting of the steering wheel, no display could take place. This shortcoming alone would keep one skilled in the art from using a front projection.

Furthermore, the "Kleinschmidt" reference refers to a diffuser for image generation in front of the driver. The "Jost" reference, however, refers to a mirror and no diffuser in the area of the instrument panel. In addition, the diffuser in "Kleinschmidt" is only used for back-projection. However, one skilled in the art has no a reason to replace the mirror by a diffuser, nor a reason to change to a front projection. Accordingly, one skilled in the art does not arrive at the subject matter of claim 16 based on the "Jost" and Kleinschmidt" references, whether taken alone or in combination.

Accordingly, the "Kleinschmidt" and "Jost" references do not render claim 16 unpatentable. Accordingly, claim 16 and its dependent claims are allowable..

Claim 33

In this claim, it is also stated explicitly that the projection unit has a liquid crystal display, and that the image of the liquid crystal display is imaged onto the display surface. In supplement, it is emphasized at this point that even the places in the text cited by the Examiner are not able to show that a real image is able to be imaged on a mirror surface. Therefore, claim 33 is allowable.

Dependent Claims

Comments on Claim 32

The mirror in the "Jost" reference has the object of deflecting the light and also has the function of collecting the light, similar to a collective lens, in order to, in particular, compensate for the curvature of the windshield (column 3, lines 27-28). The projection area (STRS) in "Kleinschmidt" has the object of projecting the image in the first place and generating it. An exchange of the mirror by a projection area is therefore not obvious to one skilled in the art.

B. The Rejections Under 35 U.S.C. § 103(a) That Claims 27 to 30 Are Unpatentable Over Jost et al., U.S. Patent No. 4,919,517 In View of Kleinschmidt, U.S. Patent No. 6,750,832, And Further In View of Hwang et al., U.S. Patent No. 6,317,170

Claims 27 to 30

Claims 27 to 30 were rejected under 35 U.S.C. § 103(a) as unpatentable over the "Jost" reference in view of the "Kleinschmidt" reference and further in view of Hwang et al., U.S. Patent No. 6,317,170 (the "Hwang" reference).

Claims 27 to 30 depend from claim 16, and are therefore allowable for essentially the same reasons as claim 16, as explained above.

The Examiner has not demonstrated that a projection of a real image on the surface of mirror 11, according to the "Jost" reference, is possible at all. As explained herein, such a projection is not possible. A corresponding screen 1000 according to the "Hwang" reference would therefore not be known from the "Jost" reference, but only from the "Kleinschmidt" reference, in which, however, the projection unit is situated behind the display, and therewith in the instrument panel. Therefore, one skilled in the art will not use the device of "Hwang" in the case of a device according to "Jost". Therefore, even an overall view with the "Hwang" reference cannot make obvious the presently claimed subject matter.

Also, "Hwang" points out especially that the device therein is provided only for particularly large screens (column 1, line 23). For this reason alone, it will not be used in a motor vehicle, which has substantially smaller projection areas. One skilled in the art will therefore not take into consideration the document of "Hwang", starting from "Kleinschmidt" or "Jost".

For the above reasons and for the reasons cited in the Appeal Brief and in the Reply Brief, it is respectfully requested that the obviousness rejections as to all of the claims 16 to 42 be reversed.

Accordingly, it is respectfully submitted that claims 16 to 42 are allowable for the above reasons.

CONCLUSION

In view of the above, it is respectfully requested that the rejections of claims 16 to 42 be reversed, and that these claims be allowed as presented.

Respectfully submitted,

Dated: 6/1/2006

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30.4 SPHERICAL MIRRORS: CONCAVE MIRROR

A plane mirror is a limiting form of a spherical mirror, i.e., a spherical mirror for which R, the radius of curvature, approaches infinity. We wish now to treat the general case of a spherical mirror. Two varieties are possible, concave and convex mirrors. A concave mirror is shown in figure 30.8. We shall discuss the convex mirror in due course.

In figure 30.8 we see two rays which come from the tip of the object S. Ray 1 strikes the center of the mirror, and is reflected as shown, with angles i and r equal. Ray 2, when extended, goes through C, the center of the sphere of which the mirror is a part. Since all radii are perpendicular to the surface of the sphere, ray 2 is reflected straight back on itself. The reflected rays A and B, when viewed by eye, appear to come from point S'. Since these two, as well as all other rays, appear to come from S', one therefore sees an image of S at S'.

We wish to find an algebraic expression relating the object distance p, the image distance p', and the radius of curvature of the mirror R. These distances are all shown in figure 30.8. Calling the length of the object S and the length of the image S', we see from the shaded triangles in the figure that

$$\tan r = \frac{S'}{p'} \qquad \text{and} \qquad \tan i = \frac{S}{p}$$

But the law of reflection tells us these two angles are equal; so we can set

$$\frac{S'}{p'} = \frac{S}{p}$$

from which

$$\frac{S'}{S} = \frac{p'}{p} \tag{30.2}$$

A second relation can be obtained for S'/S by noting from the figure that

$$\tan\theta = \frac{S}{R-p} \qquad \text{and} \qquad \tan\theta = \frac{S'}{p'-R}$$

from which

$$\frac{S'}{S} = \frac{p'-R}{R-p}$$

Equating this expression for S'/S to the one given in *30.2,* and rearranging, we find

the mirror equation

$$\frac{1}{p} + \frac{1}{p'} = \frac{2}{R} \tag{30.3}$$

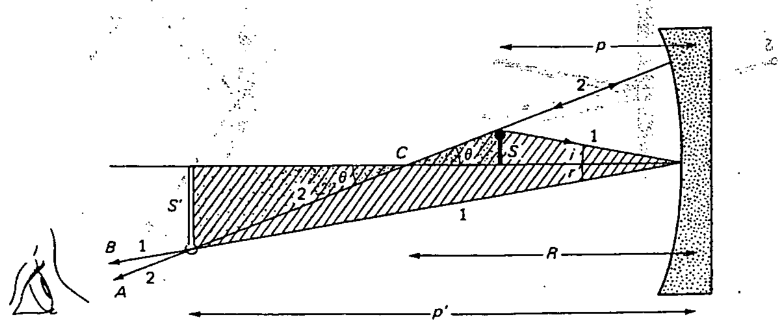

figure 30.8 *What is the algebraic relation between p, p', and R for a concave mirror such as this?*

This is one form of the *mirror equation*. It relates the object distance p to the image distance p' and the radius of curvature of the mirror. We shall see later that a clear image is obtained only if the rays are restricted to the central portion of the mirror. When light is reflected from more than a small fraction of a hemisphere, the image is not well defined, and *30.3* is of qualitative value only.

An interesting case arises if the object S is very far from the mirror. In that case $1/p \to 0$, and so *30.1* gives $p' = R/2$. The image of a distant object is found at a point halfway between the mirror and the center of its sphere. This point is called the *focal point*, and its distance from the mirror is designated f, the *focal length*. As we saw earlier in this chapter, if the source of light is far away, the rays of light caused by it are essentially parallel. Light rays from the sun, for example, would appear parallel, as shown in figure 30.9. They would be focused so as to form an image of the sun at the focal point of the mirror, as shown. In terms of the focal length, $f = R/2$, *30.3* becomes

a distant object is imaged at the focal point

$$\frac{1}{p} + \frac{1}{p'} = \frac{1}{f} \qquad 30.4$$

the focal length of a spherical mirror is $R/2$

Because of the symmetry between p and p' in *30.4*, we see that the image and object can be reversed in position. One important consequence of this is that the direction of light rays can be reversed and still represent a possible physical situation. For example, in figure 30.9, light coming from a source placed at the focal point would be reflected as parallel light (i.e., as a plane wave). This is a convenient method for obtaining plane waves (or parallel light) without resorting to a distant light source.

It is often of importance to find the relative size of the image formed by a mirror. This can be found by use of *30.2*. The ratio S'/S, the ratio of the image height to the object height, is often called the *magnification* of the system and is given by *30.2* to be

$$M = \text{magnification} = \frac{S'}{S} = \frac{p'}{p} \qquad 30.5$$

the magnification relation

Clearly, the images of distant objects will be greatly reduced in size.

A serious problem occurs if a spherical mirror is too highly curved. Rays which strike the edges of such a mirror are not properly focused. This is easily

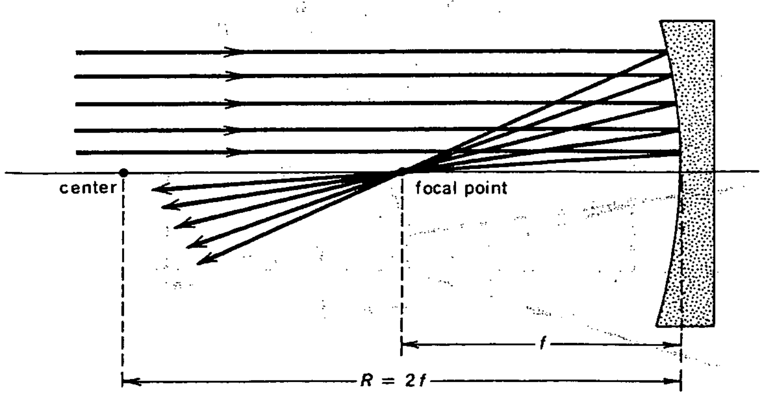

figure 30.9 *How can one make use of a distant light source to find the focal length and radius of curvature of a spherical mirror?*

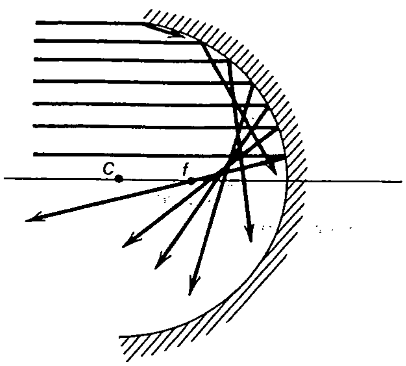

figure 30.10 Rays striking a highly curved spherical mirror are not properly focused by the outer portions of the mirror. What shape should the mirror have for proper focusing?

seen by reference to figure *30.10;* the reflection path of the parallel rays shown there can be drawn by setting the incidence and reflection angles equal. Instead of converging to the focal point as they should, the rays reflected from the edge of the mirror do not converge to a single point, as you can see from the figure. Because of this defect, only the central portion of a spherical mirror should be used if sharp images are to be obtained with it. One can correct this defect of spherical mirrors, called *spherical aberration,* by shaping the mirror to be a paraboloid of revolution. However, even in the case of paraboloids, the image will not be sharp if the object is too far away from the axis of the mirror.

illustration 30.2
An image of a tree 20 m from a concave mirror (R = 50 cm) is formed by the mirror. Find the position and relative size of the image.
reasoning Using the mirror equation, we have (taking all dimensions in meters)

$$\frac{1}{20} + \frac{1}{p'} = \frac{2}{0.5}$$

from which $$p' = 1/3.95 \approx 0.253 \text{ m}$$

Notice that the image will be only 0.3 cm from the focal point of the mirror.
From the magnification equation,

$$\frac{S'}{S} = \frac{0.253}{20} = 0.013$$

The image is slightly more than 1 percent as high as the object.

30.5 SPHERICAL MIRRORS: CONVEX MIRROR

A convex mirror is shown in figure 30.11. The two rays drawn from the tip of the source S are seen to come from S' when viewed from the extreme left of the diagram. You should check their construction. Construction of other rays also shows that S' is an image of S. Let us now find a relation between p, p', and R for this situation.

You should be able to show that the angles labeled θ in figure 30.11 are equal. Call S and S' the object and image heights; we have from the figure that

$$\tan\theta = \frac{S}{p} \quad \text{and} \quad \tan\theta = \frac{S'}{p'}$$

from which $$\frac{S'}{S} = \frac{p'}{p} \qquad 30.6$$

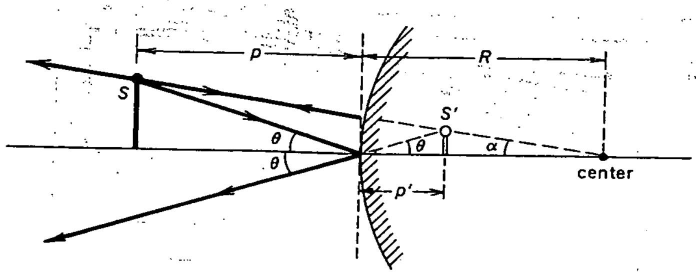

figure 30.11 In order for the mirror equation 30.3 to apply to this case, both R and p' must be taken as negative.

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SUPPLEMENTAL REPLY BRIEF TRANSMITTAL

SIR:

Accompanying this Supplemental Reply Brief Transmittal is a Supplemental Reply Brief (as requested in the Board Decision of March 8, 2006) for filing in the above-identified patent application in response to the Supplemental Examiner's Answer of April 10, 2006, together with two courtesy copies thereof (although not required). The two-month response date is June 12, 2006 (since June 10, 2006 is a Saturday, and since the Supplemental Answer is dated April 10, 2006).

While no fee is believed to be due, the Commissioner is authorized to charge, as necessary and/or appropriate, any additional and appropriate fees (including any extension fees) or credit any overpayment to Deposit Account No. **11-0600**~~. A duplicate~~ copy of this transmittal letter is enclosed for that purpose.

Respectfully submitted,

Dated: 6/1/2006

~~By: G. A. Messina~~ (Reg. No. 33,865 Aaron C. Deditch)
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